March 17, 1936. R. W. McLAUGHLIN, JR 2,034,265

PREFABRICATED HOUSE AND BUILDING CONSTRUCTION

Filed Aug. 5, 1933 3 Sheets-Sheet 1

FIG. 1.

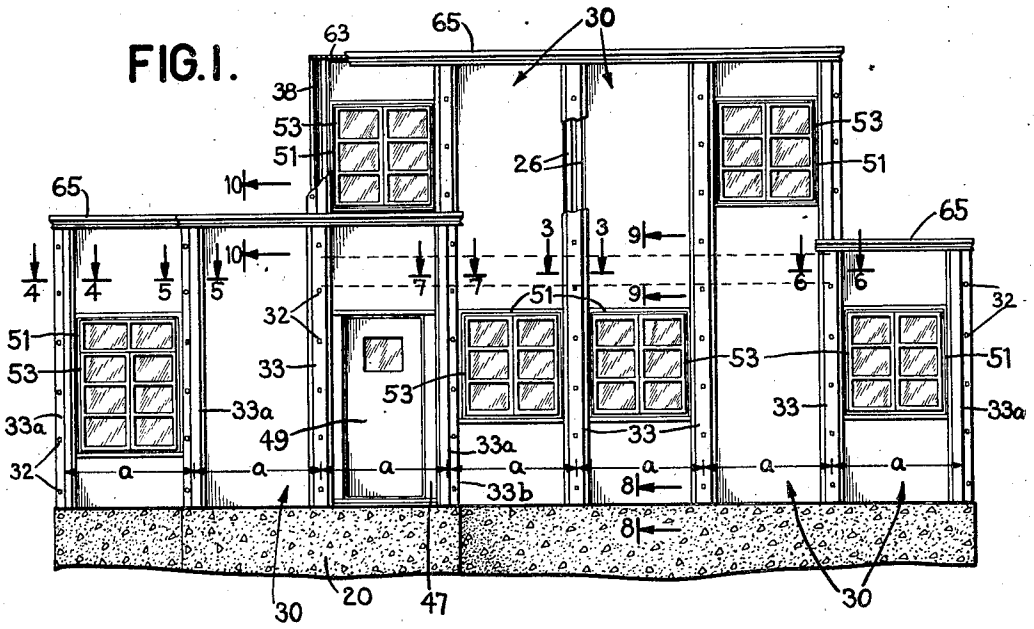
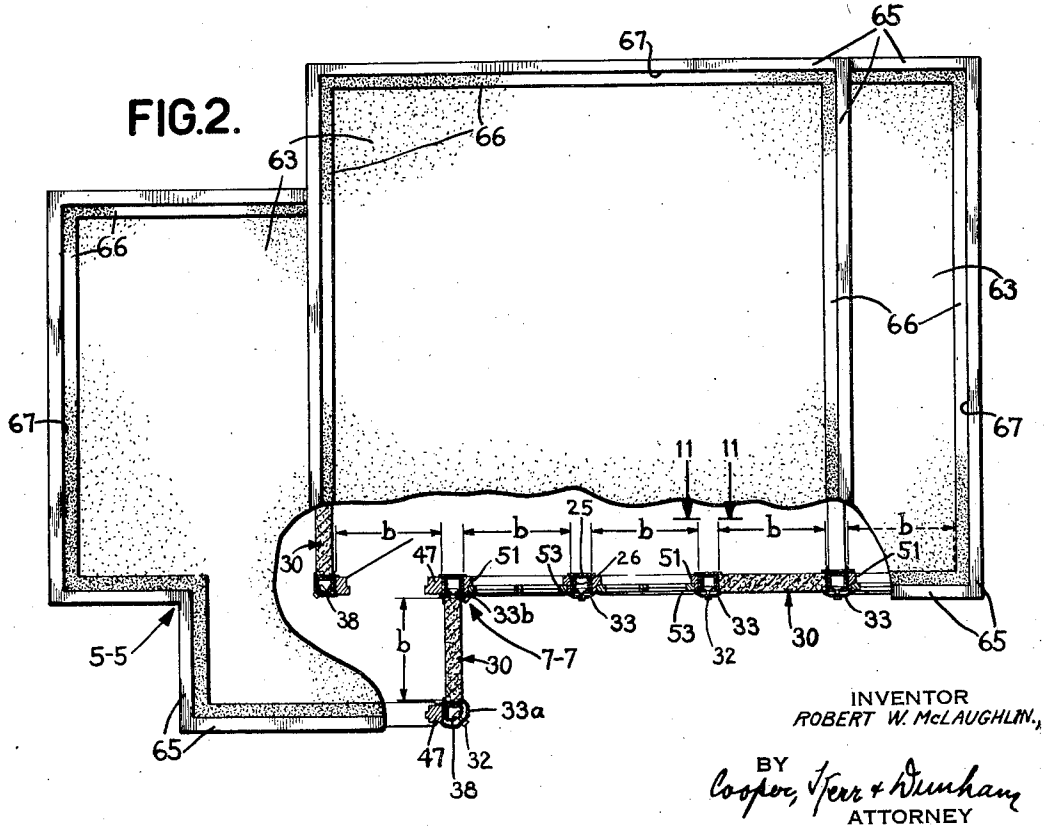


FIG. 2.



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Filed Aug. 5, 1933 3 Sheets-Sheet 2

FIG.3.

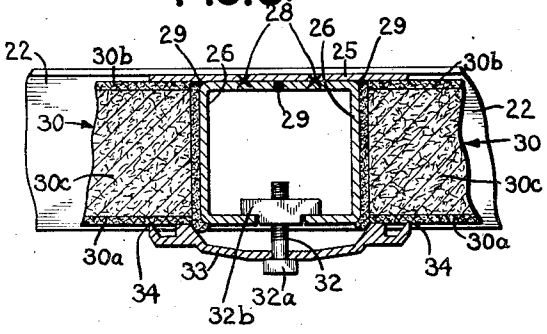


FIG.4.

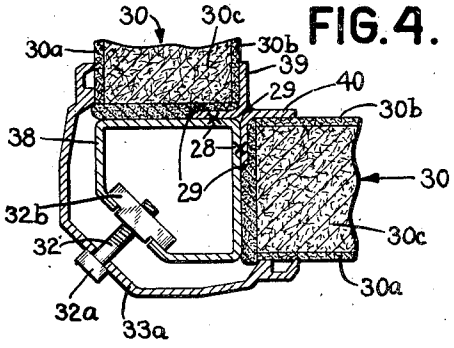


FIG.6.

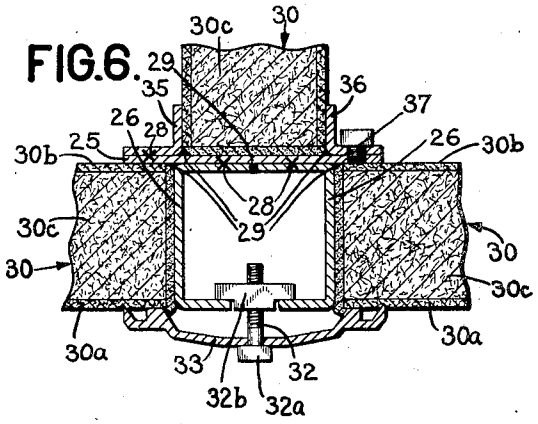


FIG.5.

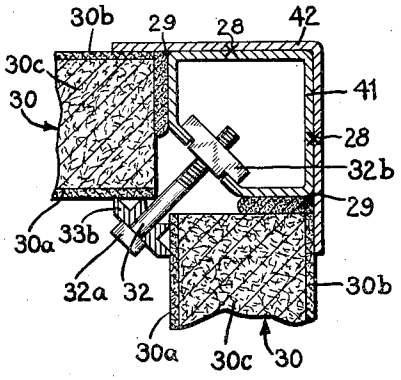


FIG.7.

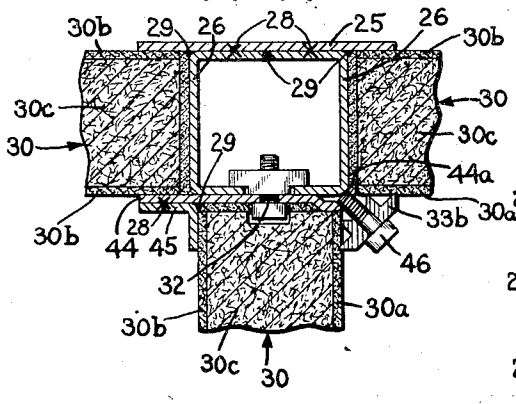
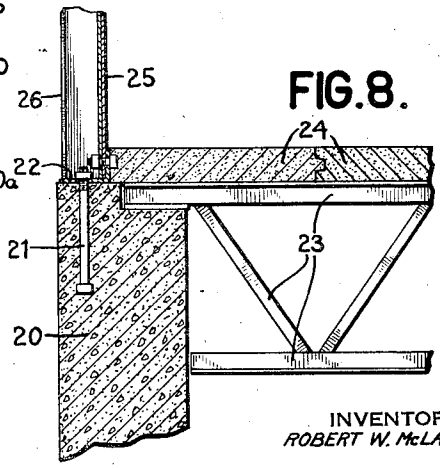


FIG.8.



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Filed Aug. 5, 1933 3 Sheets-Sheet 3

FIG.9.

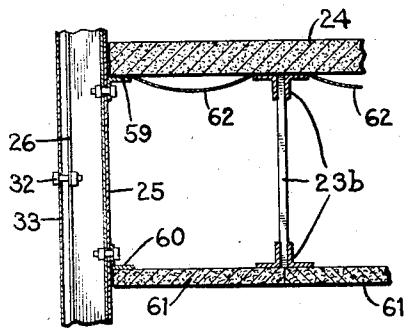


FIG.10.

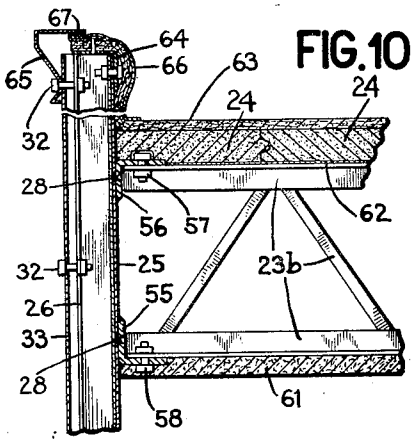


FIG.12.

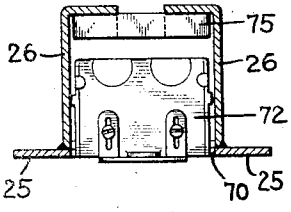


FIG.13.

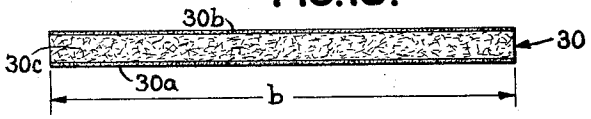


FIG.14.

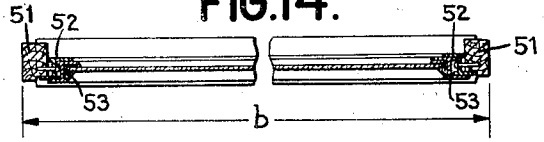


FIG.15.

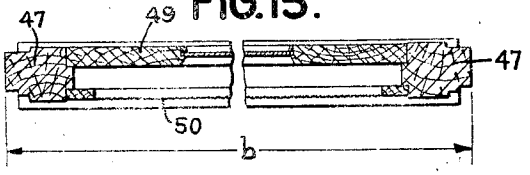


FIG.11.

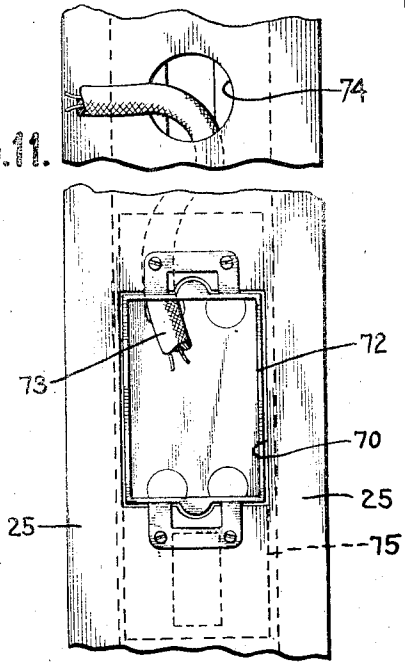
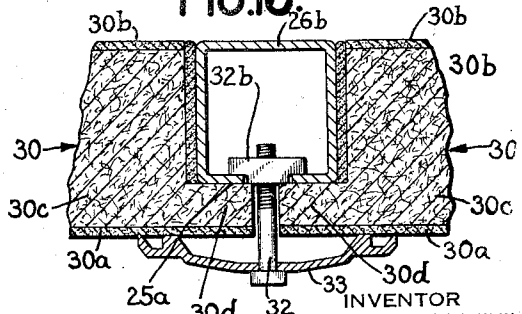


FIG.16.



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Patented Mar. 17, 1936 2,034,265

UNITED STATES PATENT OFFICE

2,034,265

PREFABRICATED HOUSE AND BUILDING CONSTRUCTION

Robert W. McLaughlin, Jr., New York, N. Y.

Application August 5, 1933, Serial No. 683,721

8 Claims. (Cl. 72—1)

This invention relates to improvements in prefabricated houses and prefabricated building construction.

Many efforts have been made to reduce the cost of building operations, particularly in the building of homes. In usual house building operations, it is the general practice to cut and shape the structural and covering materials upon the job and such procedure has been necessary since the plans and dimensions of different houses varied so widely. While efforts have been made heretofore to provide pre-cut house building material the resulting structures were not particularly sightly and required considerable labor on the job in the erecting of the structure and in the shaping on the job of certain materials used in the construction. Such previous structures furthermore were not capable of being readily altered or changed in plan or dimension.

The present invention is directed to the improvements in the construction of prefabricated houses and buildings to the general end that previous difficulties with this general type of construction may be overcome, costs lowered, erection facilitated, adjustability obtained so that additions or alterations can be made at any time practically without loss of material and fire resistant and insulating properties provided for.

A further object of the present invention resides in the provision of an improved frame construction with provisions for receiving and securing closure members in the form of side boards or slabs, doors and windows thereto in such a manner that interchangeability and uniformity of width of the wall slabs, doors and windows may be secured irrespective of their location upon the frame.

A further object of the present invention resides in the provision of a frame construction for a prefabricated house which is adapted to have outside corners, inside corners and like sections and to receive and secure closure members without the necessity of cutting or specially shaping them at the corners and at other points.

A further object of the present invention resides in the provision of a construction wherein a common wall slab or wall board may be provided to afford both the interior and exterior surface wall while maintaining the sightliness of both the inner and outer wall surfaces and to also afford heat insulation and weather resistant characteristics.

A further object of the present invention resides in the provision of a prefabricated house construction with a metallic frame work in which provision is made for protecting the frame work from the influence of weather at the exterior and in which heat insulating characteristics may be provided at points adjacent the frame work.

A further object of the present invention resides in a construction providing improved means for supporting a floor or a roof from the frame work of a prefabricated house and for sealing off the roof.

A further object of the present invention resides in the provision of an improved construction in which better heat insulation is secured below the roof or floors and in which sound deadening properties are obtained between upper and lower floors.

A further object of the present invention resides in the provision of an improved wall slab, window or door frame securing means in the nature of an ornamental batten which may be fastened to the frame work or studding.

A further object of the present invention resides in the provision of improved vertical studding including corner post studding with improved means affording an abutment and clamping means for securing wall boards or slabs or other closure members to said studding.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which show by way of illustration a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated of applying that principle. Other embodiments of the invention employing the same or equivalent principle may be used and structural changes made as desired by those skilled in the art without departing from the present invention and within the spirit of the appended claims.

Figure 1 shows a side elevational view of a prefabricated house incorporating the features of the present invention. In this view certain parts are shown broken away to show the underlying construction;

Fig. 2 is a top plan view of the structure shown in Fig. 1 with certain parts shown in section;

Fig. 3 is a detail enlarged sectional view taken substantially on line 3—3 of Fig. 1 and showing the construction of one of the vertical frame work stud assemblies and the manner of supporting the wall panels thereby;

Fig. 4 is an enlarged sectional views taken substantially on line 4—4 of Fig. 1 and shows the corner post construction for an outside corner

and the manner supporting the wall panels or sections thereby;

Fig. 5 is a section taken substantially on line 5—5 of Fig. 1 (see also 5—5 Fig. 2) and shows the construction at a so-called inside corner;

Fig. 6 is a section taken substantially on line 6—6 of Fig. 1 and shows the manner in which support for the wall members is provided at a point where a cross partition wall is to be provided;

Fig. 7 is a section taken substantially on line 7—7 of Fig. 1 (see also 7—7 of Fig. 2) and shows another wall supporting construction where a T connection is to be made;

Fig. 8 is a detail sectional view taken substantially on line 8—8 of Fig. 1 and shows the manner connecting the vertical stud assemblies to the sill member of the frame work and the manner of supporting the floor beams or joists on the foundation;

Fig. 9 is a detailed enlarged sectional view taken substantially on line 9—9 of Fig. 1 and shows the manner of supporting an upper floor or roof and the manner of providing heat insulation intermediate the floor or roof and the ceiling below it;

Fig. 10 is a detail sectional view taken on line 10—10 of Fig. 1 and shows the construction of the roof and the support therefor;

Fig. 11 is a view showing the manner in which the studding assemblies may be utilized for providing an electrical wiring conduit and for receiving and supporting a switch box;

Fig. 12 is a view showing the manner in which the vertical stud shown in Fig. 11 is reinforced adjacent the point where the same is cut out to provide for the introduction of a switch box;

Fig. 13 is a cross-sectional view of one of the wall slabs;

Fig. 14 is a cross-sectional view of a window construction;

Fig. 15 is a cross-sectional view of a door construction; and

Fig. 16 is a view of a modified form of studding and wall board support.

Before describing the details of construction, the general features of the construction may be briefly alluded to.

A preferred embodiment of the prefabricated houses or buildings comprises a metallic frame work which includes vertical studding assemblies, beam or joist assemblies, wall joists and sill members. The vertical studding assemblies are of uniform length for all portions of the building, having a uniform height. Such vertical members may be of one length for a one-story construction and of a different length for a two-story construction, etc. Such assemblies are pre-drilled to receive the fastening bolts at the required points. The assemblies furthermore are of such shape as to provide receiving means for securing side closure members thereto which member may be wall boards, window or door frames.

The wall board side closure members are in the form of laminated or composition boards. They are of uniform width and have a weatherproof or weather resistant exterior, a finished exterior surface and have an intermediate cellular body which provides insulating properties. The inner and outer surfaces may be of asbestos or similar material and the cellular body may be any material which provides the required porous and cellular characteristics. The boards are adapted on their exterior to resist the influence of weather and on their interior to provide a finished surface for directly receiving wall covering such as wall paper, paint or the like. The wall boards are of substantial thickness to provide substantial heat insulating characteristics. The doors and windows are mounted in frames, which frames are interchangeable with the side wall members. Heat insulation material such as mineral wool, may be packed in the hollow interior of the vertical studding assemblies and a dead air space is provided underneath the ornamental battens which are secured to such studding assemblies. These finishing battens are of metallic construction and are provided for the covering of the vertical joints of the side members and for covering the framing adjacent such joints and for securing the closure members to the frame. Different configurations of battens are provided for the different locations, i. e. on the straight walls and on the inside and outside corners. The battens are arranged to tightly seal with the side closure members and protect the frame work against the influence of weather. The vertical studding assemblies of the frame work being hollow may be used to receive wiring, piping and the like.

The supporting structure for the floor and roof preferably comprises floor slabs, which floor slabs preferably may be of reinforced gypsum. Such slabs when used for a floor may be overlaid with a finished floor surface and when used for a roof may be overlaid with a multiple ply felt and asphalt composition roof.

Metallic cornice members are also provided for sealing off the top of the walls and for sealing and securing the roofing material in place.

In the accompanying description, like reference numerals will be used to identify like parts. In the erecting of a house or building of this character the foundation, which may be of any form, such as one of concrete or concrete blocks and generally designated 20 in Figs. 1 and 8, is first laid. In the foundation, suitable sill supporting bolts 21 (Fig. 8) are disposed. These bolts 21 receive and secure to the foundation 20 the sill parts of the steel frame work structure. This steel frame work preferably comprises an angle shaped metallic sill member 22 (Fig. 8). The vertical part of the angle is toward the interior of the house or other structure, the interior being to the right in Fig. 8. The foundation 20 also provides a support for the cross beams or joists which support the lower flooring. In Fig. 8 a cross beam or joist is indicated at 23. This joist is preferably of prefabricated steel construction with upper and lower angle members and transverse metallic truss members. The steel joists 23 support flooring slabs which may be of any conventional and desired construction. In practice, slabs made of gypsum like material reinforced with steel are found satisfactory. Such floor slabs are indicated at 24. It may be explained that similar floor slabs are used for supporting the finished flooring for the second floor and for also supporting the roofing material. The floor slabs accordingly will be given the same reference numeral 24 in Figs. 9 and 10.

Frame work

The frame work of the structure comprises vertical studding assemblies and corner post assemblies which are bolted to the sills 22. These vertical studding and corner post assemblies are so relatively disposed to each other and provided with receiving portions of such shape and nature that side wall slabs of identical dimensions as to width can be used in all portions of the structure irrespective of whether the slab is to be disposed in a straight run of wall or adjacent to an

inside or outside corner. Accordingly, special cutting and shaping of the wall slabs is obviated. At any point where a side slab is disposed, such side slab or a portion of it may be removed and a window frame or a door frame substituted in lieu thereof or side closures transposed interchangeably from place to place. The identity of lateral width of the slabs, door frames and window frames can be seen by inspection of Figs. 13, 14 and 15. The frame work or studding is arranged to interchangeable receive either side wall slabs or boards, windows or door frames.

A typical studding member used on one of the sides of the house or structure will now be described with reference to Fig. 3. The studding assembly here shown comprises a rear plate **25** to which are secured two channels **26**, the open troughs of which face one another as shown in Fig. 3. In lieu of two channels, a slotted tubular member may be used. The channels **26** are preferably secured to the plate **25** by welding the same as indicated by the crosses at **28** and by the welding material at **29**. Such studs are bolted to the sills as shown in Fig. 8. The part of the plate **25** which projects beyond the bottoms of the channels **26** forms a rear support for receiving the side wall boards or slabs. Such side wall boards or slabs are generally designated **30** in Fig. 3 and such slabs preferably comprise an outer impervious board layer **30***a* which provides an outer wall surface, an inner impervious board layer **30***b* providing an inner finished wall surface and intermediate insulating material **30***c*. This insulating material may comprise any porous material such as vegetable fibre or other cellular material and the slabs are fabricated so that they are received and erected as a unit.

To hold the side slabs **30** in place on the studding a preferable and convenient arrangement comprises a toggle bolt structure as indicated at **32**. The toggle bolt comprises a cap stud element **32***a* and a cross member **32***b*. The cross member **32***b* may be turned on the stud **32***a* so as to pass between the facing edges of the channels **26** which define a continuous bolt receiving slot. By having the slot continuous the toggle bolts or other fastenings can be inserted in any position therein with alignment of the parts. Thereafter, by turning the bolt, the T-shaped nut can be engaged and held against rotation between the two channels. The toggle bolts are used to hold batten elements **33** in place. Such batten elements preferably are made of suitable aluminum or other alloy or composition and are provided with sharp portions as at **34** to bite into the outer surface of the wall boards and provide a weather tight joint and at the same time hold the wall boards in place against the abutments provided by the back plate **25**. If desired, insulating material can be packed in the hollow interior of each metallic stud assembly to provide heat insulation at such points. Also in erecting, a mastic composition is introduced between the side edges of the wall slabs and the back of the channels **26** to provide a tight seal.

The studding construction of Fig. 6 will now be described. This construction comprises the plate **25**, the channels **26** welded thereto, the batten **33**, the toggle bolt assembly **32** as before. With this construction three wall boards **30** are to meet at the stud in place of two wall boards in alignment as with the Fig. 3 construction. Accordingly, to support the extra wall section, two additional angles **35** and **36** are provided. Angle **35** is preferably welded to the plate **25** as indicated by the cross mark and angle **36** is preferably bolted thereto by a bolt as indicated at **37**. The bolted on angle permits introducing the wall board in place.

For a corner post where an outside corner is to be provided, the construction shown in Fig. 4 is employed. This construction comprises a shaped metallic section **38**, shaped as shown and arranged to receive in the slotted opening between the edges the toggle bolt **32**. Supplemental angles are provided as indicated at **39** and **40** which are united to the member **38** by welding at the points indicated by the crosses and at the notch between angles **39** and **40** and at the ends thereof as shown. In this figure, two wall board or slab sections **30** are shown extending toward each other at right angles and such wall boards are secured in position by the batten member **33***a*.

For an "inside" corner construction, see Fig. 5 and section **5—5** of Fig. 1, the vertical studding assembly comprises a member **41** having the shape shown to which is secured by welding an angle **42**. The ends of the angle **42** which project beyond the bent portions of **41**, provide for the support for the wall members **30**. The clamping of the wall members in place is secured by an inside batten **33***b* which is secured by the toggle bolts **32**.

In certain cases both an inside corner and a through wall or T connection must be provided for the wall slabs. Fig. 7 illustrates a construction adaptable for this purpose. This studding construction comprises rear plate **25** having secured thereto the two channels **26** with the trough portions facing each other. The toggle bolt **32** in this instance secures to the assembly a supplemental plate **44** which has an angle **45** welded thereto and plate **44** also has an extending end portion **44***a* turned at an angle and tapped to receive a cap bolt **46** which cap bolt **46** secures in place the batten **33***b*.

While I have shown the studding assemblies, etc. as made of plates, angles, channels and the like secured together by welding, it will be understood that the parts may be fabricated in a unitary manner by special dies, rolling, etc. At the present time welding affords a convenient way of fabricating the special sections.

The foregoing arrangement of studding assemblies, corner post assemblies and slab securing means provides for the disposing of the stud and corner post assemblies in uniform spacing relation. In Fig. 1 this uniform center to center spacing is indicated by the uniform dimensional lines designated *a*. The uniformity of width of the slabs, windows, doors, etc. is indicated by the dimension lines designated by reference letter *b* in Fig. 2. By providing such uniformity, prefabricating of the wall members with a fixed width is facilitated and special cutting and shaping of the wall members, particularly adjacent corners and windows, is obviated.

Doors and windows

Provision is made for placing either a door or a window in any slab location. A preferable door construction is shown in Fig. 15. It comprises a door frame **47** preferably made of wood and arranged to receive a door **49** and a screen **50**. The window construction is shown in Fig. 14. Such window construction comprises a wooden frame **51** receiving another frame **52** which in turn receives the window sash frame **53**. As shown in Figs. 13, 14 and 15 there is an identical

width dimension *b* for the wall slab, the window frame **51** and the door frame **47**. Accordingly, it is possible to place between any two adjacent studding members either a wall slab, a window or door.

An upper floor support or a roof support may conveniently be provided in the following manner.

Referring to Figs. 9 and 10, **23***b* designates a prefabricated steel beam or joist provided with upper and lower channels and bracing truss members as shown in Fig. 10. Such prefabricated joists are preferably secured to the vertical studding by means of angle shaped saddles **55** and **56**. Such angle shaped saddles are preferably secured to the studding members by welding as indicated and each cross beam or joist is bolted thereto by bolts **57** and **58**. Adjacent the side walls and parallel to the beams **23***b* there are provided wall joists preferably comprising angle members **59** and **60** (see Fig. 9) which angle members are preferably secured to the stud assemblies by bolts. A ceiling material as indicated at **61** may be secured to the lower flange of the beams **23***b* and to the lower angle **60** of the wall joist in any desired manner. The upper angle **59** of the wall joist and the upper webs of the beams **23***b* are adapted to receive and support the floor or roof slabs **24**. These floor or roof slabs are all of identical configuration to those previously described, viz. they are made of gypsum or like material reinforced with steel. Below the roof, and below a floor if desired, to provide additional heat insulation, aluminum or like foil material as indicated at **62** may be provided, which material is supported by the beams and angles as shown and spaced slightly from the overlying slabs **24**. In this way a dead air space is provided and the heat radiating characteristics of the aluminum or like foil are utilized to give additional heat insulation below the roof or floor when desired. Overlying the floor slabs **24**, there may be provided a finished floor in case the floor slabs are for a floor construction or in the event that the slabs **24** are used for a roof supporting structure, roofing material of the multiple ply asphalt and felt type may be provided as indicated at **63**. At the top of the frame, the vertical studs and corner posts are united by an angle **64** (Fig. 10) which is bolted thereto. The roofing material **63** preferably extends up and overlies the top of this angle. A further seal and finish for the top of the wall is provided by a finishing cornice batten of pressed metal, preferably an aluminum alloy or other composition and shown at **65**. Such cornice may be secured to the studding by the regular toggle bolts **32** and the cornice may also be bolted to the angle member **64** so as to clamp and seal the roofing material upon the top of the angle member **64**. A supplemental roof seal may be provided by sheet roofing material **66** which may be extended up to overlie a top portion of the cornice and may be caulked in a re-entrant notch **67** of the cornice to provide a water tight construction.

Figs. 11 and 12 show the manner in which the vertical frame studs may be used as a conduit for electrical wiring. In Fig. 11 the plate **25** is shown cut out at **76** to receive a sheet metal switch box or outlet receptacle **72**. The wires are indicated at **73** and such wires may be run vertically upward through the interior of the hollow studding. At a point where a wire is to be taken through into the interior the vertical plate **25** may be provided with an opening, as indicated at **74**. When the studding is to be thus utilized for electrical wiring and where the studding plate **25** is apertured as indicated at **76**, it is preferable to provide a supplemental reinforcement adjacent the cutaway portion. Such supplemental reinforcing plate is indicated at **75** in Fig. 12. It may be welded or otherwise secured to the channel members **26** and is disposed at a point preferably adjacent and extending somewhat beyond the opening **76**, see the dotted line showing with corresponding reference numeral **75** in Fig. 11. The hollow studding also may be used as a passage for any piping, conduits, wiring, ducts, etc.

Fig. 16 shows a modification employing a hollow studding member **26***b* with portions defining a bolt receiving slot to receive a toggle bolt **32**. In this embodiment the abutment portion for wall slab or side closure element is at **25***a*. The wall slab is provided with projecting portions **30***d* to cooperate with the abutment portion **25***a*. The batten **33** is used as before. This construction eliminates the inside projection which exists with the Fig. 3 construction, but requires special forming of the side edges of the wall slabs or other side closure elements.

The manner of erection will be readily understood. The sills **22** are first bolted in place on the foundation. The lower floor joists are placed and bolted in position and the lower floor slabs are placed upon the joists. The vertical studding assemblies are bolted to the cross joists for the second floor or roof and the assembling of such parts is preferably made upon the ground. The assembly of stud and joists is then raised by means of an A frame and the studs are bolted to the sills. Thereafter the wall joists and the angle **64** are secured in position. The floor and roof slabs are placed in position and the roof may be laid before the side slabs and windows are placed in position. The side slabs, windows and doors are then swung into position and temporarily held by clamps to the channels. Mastic may then be forced in at the side of the closure members between such members and the frame work. The temporary clamps are then removed and the ornamental slabs and battens are then secured in position.

While the frame work is preferably erected first under certain conditions the side closures may be erected and placed in position with portions of the frame work secured thereto without departing from the spirit and scope of the present invention.

The arrangement of the studding members is such that a continuous vertical slot is provided for bolt fastening means, whereby a bolt may be secured in any vertical location to the stud, thus obviating the necessity of lining up bolt holes.

Certain features of the present invention relating to the novel construction of studding form the subject matter of my copending divisional application, Serial No. 724,469, filed May 8, 1934.

What I claim is:

1. A prefabricated building construction including a structural frame work comprising spaced vertical metallic studding, joists carried by said studding, slabs carried by said joists, a ceiling structure also carried by said joists and heat insulating material comprising foil-like material looped from joist to joist and providing heat insulation below said slabs.

2. A prefabricated building structure comprising spaced vertical studding, a roof structure

comprising roof slabs supported by said studding, an angle capping said studding, roofing material overlying said roof slabs and said angle, and a cornice capping said studding and securing the roofing material to said angle.

3. The invention set forth in claim 2 in which the cornice includes means for receiving supplemental roofing material thereto and for receiving caulking material for said supplemental roofing material.

4. In a prefabricated building structure, in combination, frame elements including stud elements and corner posts, means to position each of said frame elements an equal distance from each of the frame elements adjacent thereto, wall closure elements comprising door, window and wall panel elements of uniform width, any of said wall closure elements being adapted to be received and positioned by and between any pair of adjacent frame elements whereby complete interchangeability of the said door, window and wall panel closure elements is secured throughout said building structure, and holding means adapted to retain said wall closure elements in position between said studs.

5. In a prefabricated building structure, in combination, a plurality of wall closure elements, a plurality of vertical stud elements, means for positioning said closure elements between said stud elements, all of said closure elements being of equal width, all of said stud elements being so positioned that the distance from center to center of every pair of said elements is equal to the distance from center to center of every other pair thereof.

6. In a prefabricated building structure, a frame comprising a plurality of hollow, metallic stud assemblies, equally spaced one from another, each of said assemblies comprising an abutment portion adapted to receive directly a wall closure element, fastening means, said assemblies being provided with means for receiving said fastening means, and batten elements adapted to be engaged by said fastening means and cooperating with each of said abutment portions to hold and secure wall closure elements closely adjacent thereto.

7. A prefabricated building construction comprising in combination a metallic vertical stud, a wall closure element in contact with said stud, said stud comprising a plurality of abutment portions adapted to engage a plurality of predetermined faces of said wall closure element, and clamping means adapted to engage still another face of said wall closure element and cooperating with said stud to hold and position said closure element, said stud and said closure element being of approximately the same thickness.

8. A prefabricated building structure comprising wall closure elements of substantially uniform thickness and spaced metallic, vertical studding provided with integral abutment means and adapted to engage portions of a plurality of predetermined faces of each of said wall closure elements, and clamping means comprising means adapted to cover and protect the exterior faces of said studding elements and adapted to cooperate with said abutment means to hold said wall closure elements removably in substantially rigid contact with said studding.

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